Checkout Launch and Control System (CLCS)

Juno Integration Report

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1.0 Introduction

This document will record the results of Checkout & Launch Control System (CLCS) system integration for the Juno delivery. Results will be organized by CSCI, and will cover the test configuration, procedures executed, and the results of the integration effort. It will also include a list of issues (problem reports) generated for each CSCI as a result of integration.

Juno integration was performed in two distinct environments: the Satellite Development Environment (SDE-1) and Launch Control Complex (LCC-X). The configuration of each environment is documented in Appendix A, Test Configuration Matrix.

Juno system integration began on March 28, with the acceptance of delivery products. These products consist of tapes containing applicable source code, libraries, header files, static files, and documentation consisting of test procedures and listings of tape contents. Juno system integration was completed on April 15.

2.0 Juno Integration Results

2.1 MCC Services Port

2.1.1 Description

Mission Control Center (MCC) services are those services currently in use at the Johnson Space Center (JSC) in Houston, Texas. The purpose of the port is to provide a baseline for evaluation of these services for use by CLCS. The port of these services was performed by engineers from Houston, and integrated in the SDE-1 environment at the Kennedy Space Center (KSC).

2.1.2 Test Execution and Results

Formal system integration was performed from 3/31 until 4/14. Informal system integration occurred assisting developers with debug and test from 3/10 until 3/28. The initial testing was performed on Silicon Graphics (SGI) O2 workstations. Integration verified the following basic capabilities: configuration of workstation, including initialization of processes; startup of graphical user interfaces; communication between workstations; and print capabilities. System integration wrote a test procedure, with engineering assistance, to verify these capabilities. This procedure was executed on 3/31.

After completion of integration on the O2 platform, integration was started on Indigo workstations. Since these workstations were used for development during Juno,

they were not available for use until 3/31. System integration created a baseline for the Indigo workstations, and performed a build of that baseline. Once the baseline build was completed, and the OS baseline for running the MCC services was installed on the machines, system integration was able to begin. The same procedures used for the O2 workstations were performed on the Indigo workstations, with similar results.

The following results were obtained from MCC Services testing:

- All basic system capabilities were verified.

- Test procedure was run, with several problems noted.
  None of the problems were critical.

- Issues generated:
  - Juno-01 Environment variables in mwm xterm
  - Juno-02 Remote log status not available
  - Juno-03 Core dump on Modify Timer
  - Juno-04 Copy timer does not work
  - Juno-05 Deconfigure hangs on logout
  - Juno-06 Font problem on Delog GUI
  - Juno-07 Cannot print man pages from Printer Services
  - Juno-12 Remote delog written into wrong directory

2.2 Gateway Services

2.2.1 Description

Gateway services provide transition of data from outside sources into the CLCS environment. In the Juno delivery, the gateways provide a consolidated Shuttle Data Stream (SDS) to the Data Distribution Processor (DDP) and HCI workstations.

2.2.2 Test Execution and Results

Testing of the gateways consisted of executing test procedures provided by software development personnel. The following results were obtained from gateway testing:

- All basic system capabilities were verified.

- Test procedures were run. The procedures, with redlines, were incorporated into a document for system test personnel to use.

- Data flow from the gateway to the HCI was verified.

- Data flow from the gateway to the DDP to the HCI was verified, using the DDP router process delivered by reliable messaging.

- Issues generated:
  - Juno-10 Root access required for ddp_router execution

2.3 Development Environment

2.3.1 Description

The development environment provides the foundation for system and user applications. It consists of hardware and operating system (OS) software. There are multiple OS baselines for the Juno delivery: O2 workstation, Indigo workstation, gateways, and DDP/CCPs. The OS version for each hardware type is documented in Appendix A, Juno Configuration Matrix.

2.3.2 Test Execution and Results

The testing of the development environment delivery was performed from 03/31 until 04/14. The main emphasis was placed on testing OS commands (ls, cd, ps, etc.) and testing of OS network functions (Telnet, rlogin, ftp, etc.). Reliable Messaging software was incorporated into the OS baseline, providing the list of network IP addresses for devices. Testing was performed on both O2 and Indigo workstations, and challenge DDPs.

The following results were obtained from operating system testing:

- All basic system and network capabilities were verified.

- Issues generated:
  - Juno-08 Cannot run CM shell application CVS (closed)
  - Juno-09 Positional .xsession sourced on login (closed)
  - Juno-11 Telnet from sde1hci1 to sde1ddp1-r failed

2.4 LCC-X

2.4.1 Description

The Launch Control Complex HCI Testbed (LCC-X) is a prototype environment for introducing users to the control center of the future. State-of-the-art hardware and software are configured for demonstration of new technologies/methods of operation.

2.4.2 Test Execution and Results

There are no requirements for LCC-X. The integration effort was aimed at identifying the configuration (hardware and software), and verifying that data flow capabilities are the same as those in SDE-1. Hardware and software configurations are documented in Appendix A, Juno Configuration Matrix.

Data flow procedures in the LCC-X differ from those in SDE-1. There are no platform baselines available in the LCC-X. The procedures for data flow in LCC-X have been documented and made available to system test personnel.

The following results were obtained from LCC-X integration:

- Basic data flow capabilities were verified.

3.0 Lessons Learned

1. Lack of a stable configuration at the start and during formal integration

    - An ATM interface was installed in an o2 workstation after the start of integration testing. Attempts to reboot the workstation failed. SGI technical support was called and the CPU was replaced.

    - System integration in the LCC-X was impacted by scheduling hardware modifications performed during the designated system integration timeframe.

    - The SDS gateway in LCC 2R24 is not controlled by system integration/system test personnel. During the integration / system test dry runs the type of data coming out of the gateway was changed (flight 83 to flight 84 to flight 83, etc.). This caused some loss of integration/test time, and again points out the importance of a stable and frozen configuration environment for system integration and system test. Prompt support from development personnel assisted in resolving the data flow problems.

    - Development personnel were using SDE-1 workstations during integration activities. Although this caused no problems during the Juno integration, it will not be acceptable for future deliveries.

- Indigo workstations were not available for MCC Services integration until 3/28.

2. Insufficient Documentation

    - Due to schedule constraints, the procedures delivered to system integration did not contain sufficient detail. For instance, the procedures were written assuming use of the "demo" account. When the procedures were run using normal logon ids, they did not work as written. More detailed procedures and configuration documentation will be expected in the Redstone delivery.

3. Lack of a configuration management process and tool.

    - OS baselines are being stored on tape. The OS group will be the administrator of these tapes until formal CM controls are in place. The gateway OS baseline (VxWorks) is included as part of the gateway delivery.

    - The CM shell application "CVS" was not available on the workstations. This was an addition to the OS baseline, but was not installed because of the freeze of the system for integration testing. OS personnel loaded the application on all workstations at system integration request.

    - It was discovered late in the integration effort that the same version of amclm was not used for all development platforms. In fact, there were 3 separate versions of amclm used: 1 for O2 MCC services baseline, 1 for reliable messaging, and a third for gateways. Since no CM capability exists for Juno, it would be very difficult to recreate the amclm libraries used for each platform. John Porter is currently working on a plan to baseline amclm for the Redstone delivery.

4. Lack of directory structures

The DDP router process would not run unless the user was "root". The resolution of this problem was to modify the permissions on a file in the ddp_router directory to have "write" access by all users (unix perms of 777). Files created/modified by processes need to reside in a directory structure that allows write access, and the creating process needs to assign the correct permissions to the file. System Integration is coordinating actions to address directory structures for Redstone.

Appendix A
Juno Configuration Matrix

Workstation Name	Platform	OS Version	Platform Baseline
SDE-1			
sde1hci1	O2/Ethernet	Irix 6.3 970318	pss.01.02
sde1hci3	O2/Ethernet	Irix 6.3 970318	pss.01.02
sde1hci4	O2/Ethernet	Irix 6.3 970318	pss.01.02
sde1hci5	O2/Ethernet	Irix 6.3 970318	pss.01.02
sde1hci6	Indigo2/ATM	Irix 6.2 970220	None
sde1hci7	Indigo2/ATM	Irix 6.2 970220	ind.d.jn.01.01
sde1hci8	O2/Ethernet	Irix 6.3 970318	None
sde1hci10	Indigo2/ATM	Irix 6.2 970220	ind.d.jn.01.01
sde1ddp1	Challenge	Irix 6.2 970220	ch.d.jn.01.01
sde1ddp2	Challenge	Irix 6.2 970220	ch.d.jn.01.01
sde1boot	Indy	Irix 6.2 970130	None
sde1net	Indy	Irix 6.2 970303	None
sde1csg1	Gateway	VXWorks 5.2	None
LCC-X			
John	O2/Ethernet	Irix 6.3 970318	None
George	O2/Ethernet	Irix 6.3 970318	None
Paul	Indigo2/ATM	Irix 6.2 970220	None
Ringo	Indigo2/ATM	Irix 6.2 970220	None

Appendix **B**
Issue Reports